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This publication contains information regarding new developments of interest to agriculture based on laboratory and field investigations by the Du Pont Company. It also contains published reports of investigators at agricultural experiment stations and other institutions as related to the Company's products and other subjects of agricultural interest.

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AGRICULTURAL NEWS LETTER

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THE AGRICULTURAL NEWS LETTER serves as a medium of reporting new developments and ideas in agriculture, particularly those related to advancements through research. Material herein may be reprinted in whole or in part, in the interest of advancing the general knowledge of new agricultural practices.

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CUSTOMERS AT THE SAME COUNTER

The average American farm owner and a large corporation like Du Pont go shopping many times a year. In doing so, they spend their money in surprisingly similar ways.

True, Du Pont currently pays out $1.3 billion for payrolls and supplies each year, while the average farmer spends less than $10,000. With 82 plants built or building, 98 laboratories, and over 150 offices and warehouses to supply, Du Pont buyers average 1600 purchasing orders each day. Most farmers, by contrast, take a shopping list to town only once or twice a week.

These differences, however, simply follow from their different scale of operations. Buying principles and purpose remain much the same. Like the farm owner, Du Pont pays out two-thirds of its income dollar on two cost items: the people who do the work, and the supplies necessary to keep the business going. Other large costs are taxes and the replacement of obsolete machinery and equipment.

The most interesting similarity, perhaps, is the great range in size of the firms from which both Du Pont and the farm owner buy goods and services. Both make a number of their purchases from the largest corporations in the land. Telephone service, for example, is often provided by a local subsidiary of the nation's largest business. Automobiles and trucks are bought through locally-owned agencies of the giant firms which alone can produce these diverse and multi-purpose vehicles efficiently and at relatively low cost.

Majority Are Small

On the other hand, most of the 30,000 suppliers of Du Pont, like the majority of tradesmen who sell to the average farmer, are small businesses: stationery stores, automotive supply houses, hardware stores, meat markets, small machine shops, laundries, and lumber yards. In every case, the final purchase by Du Pont depends upon the answer to the same questions which every farmer asks himself when he is about to lay out hard-earned cash:

Can I expect some benefit from using this product or service?

Is its quality good? Is the price fair?

Can I expect prompt delivery, good service, and a quick and friendly adjustment if the goods delivered are not up to par.

One question never asked: How large is the company involved? For it just naturally happens that some suppliers are large and many are small businesses.

The explanation is fairly simple. Since the size of a business is dictated by the function it performs, many of the goods needed for the farm and by the manufacturer can only be supplied by a firm with large resources and facilities. Likewise, many services and goods can be most quickly and efficiently supplied by small local concerns. Both the farmer and industralist confirm this truth in their everyday experience.

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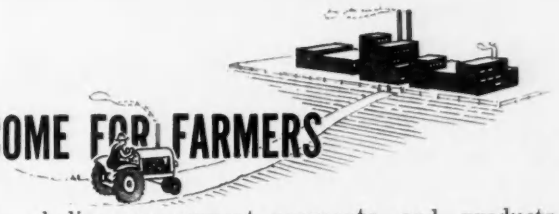
INDUSTRY PROVIDES JOBS, INCOME FOR FARMERS



When Du Pont began production five years ago at its plant to make "Dacron" polyester fiber near Kinston, N. C., some 50 per cent of its working force came originally from farm homes. This pattern of change from agriculture to industry has accelerated since World War II, a period marked by the most rapid increase of farm productivity in history.

A hundred years ago, 60 per cent of the nation's labor force was directly engaged in farming. Today, fewer than 10 per cent of the workers are so engaged. During this time, the population increased nearly six times. Manufacturing, on the other hand, has grown from about two million workers (and that included a large number of "home" industries) to about 17 million. The increase in manufacturing labor is due to the increased needs of the population and its very much higher individual purchasing power, since manufacturing has also experienced tremendous improvement in output per man-hour.

Actually, neither change could have occurred without the other — except as an expression of disaster. As the Secretary of Agriculture stated, the technological revolution in agriculture "has released nine-tenths of our manpower for non-farm production . . . This is an economic miracle — a blessing from free enterprise."

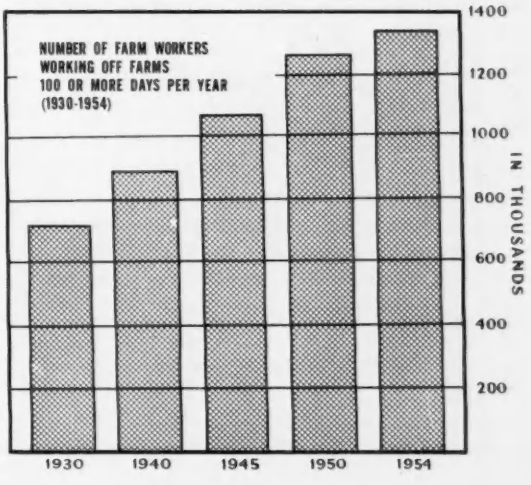
Rise in Part-Time Work

A more recent development, but one of equal importance, is the great rise in part-time work off the farm. This provides substantial additional income for the farm population and may be one of the important factors in making the transition from farm to industry go smoothly. The last farm census* brought out dramatically the significance of off-the-farm employment in terms of income: "Out of every $10 of farm family income in 1954, $5.90 was the net return from the farm operation (including government payments and products consumed at home), and $4.10 came from sources outside the farm," principally "wages and salaries for work in industry."

As a matter of fact, between 1950 and 1954, the proportion of commercial farmers working off their farm a substantial part of the time — more than 100 days — increased from 26.8 per cent of the total to 32.5 per cent. The proportion with more non-farm than farm income went up from 21.4 to 25.2 per cent. "In other words, four out of every 10 farmers in the United States are actually part-time farmers, not in the sense of the census classification but in the sense that they spend only part of their time farming."

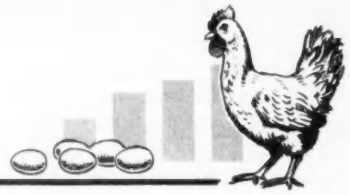
Nearly Half of Income

Over half of the commerical producers did some off-farm work in 1955, bringing in a total income of some $4.3 billion, while non-commercial farmers "get only $3.7 billion and less than half of them did some off-farm work." There are great regional variations but "the trend is evident almost everywhere at all levels." The point where half the income of the farm population comes from off-farm sources is "not far" off. Thus, another turning point in the agricultural economy, in which industry is playing a major part, is under way.



*U. S. Bureau of the Census. U. S. Census of Agriculture: 1954. Vol. III, Special Reports, Part 7, Popular Report — The American Farmer in 1954, U. S. Government Printing Office, Washington, 1956.

METHIONINE SUPPLEMENTATION of LAYING-HEN RATIONS



Two experiments involving 1200 hens were conducted by the Stine Laboratory of the Du Pont Company to determine the effect of supplemental methionine on various rations for laying hens. The results so far indicate that methionine added to high-energy diets improves the feeding efficiency of egg production. There is also some indication that methionine reduces mortality and helps keep down excessive body weight which tends to result from high-energy diets. There was no effect on egg weight, quality, composition, or shell strength.

The experimental program included a 17-week exploratory test, followed by a sustained 56-week study. Each involved a basal diet containing normally recommended protein levels, with comparisons made of the effects of adding methionine, energy, and a combination of both. There were four groups and four treatments in each test.

Test Procedure

In the first test, the birds were on a basal diet for four weeks and then 13 weeks on the experimental diets. The hens were well into the laying year when the experiment started. Each day's egg production was collected, counted, and weighed. The feed was weighed weekly and the amount consumed calculated. A sample of 13 birds from each pen was weighed once a month and mortality recorded as it occurred.

The diets used were composed of identical amounts of soybean meal, corn, peas, and other accessory factors. Fat and cellulose were used to give 922 and 1009 calories of productive energy per pound in these 16.5 per cent protein diets. Methionine supplementation was at .05 per cent in each diet.

In the 56-week experiment, no basal period was used. In this series, the diet was a more practical type — a typical laying mash with 15.6 per cent protein — and higher in energy, 991 and 1096 calories per pound. Methionine supplementation remained at .05 per cent. Since there seemed to be considerable differences between pens, it was decided to split the experiment into four 14-week periods. Thus it was possible to feed every pen each of the four treatments by moving the diets to a different pen each 14 weeks. In addition to the records kept during the preliminary experiment, 12 eggs from each pen were measured weekly for egg quality and shell strength. At the end, livers from 10 hens in each pen were analyzed. Egg composition was also studied.

The exploratory study indicated methionine had a favorable effect on feed utilization for egg production. On the basal diet it took .14 pound less to produce one pound of eggs, with methionine. When the energy level of the diet was increased with 3.5 per cent fat, the advantage due to methionine rose to .47 pound less feed needed to produce the pound of eggs. Mortality and weight gains were less than in the control groups (hens on high-energy diets tend to put on excess fat). Methionine had no effect on egg production or egg weight.*

Test Results

In the 56-week test, methionine was especially effective in improving feed utilization for egg production in the higher energy diet. A similar observation was not made on the lower energy diet. Closer examination by periods shows, however, that in three out of the four periods, methionine added to the lower energy diet resulted in slightly improved feed efficiency. Only when the lower energy methionine supplemented feed was given to the "worst" pen and its control given to the best pen was methionine without favorable effect.

A similar situation was observed on the higher energy diets where a reversal occurred during the third period when methionine was without favorable effect on feed utilization. Again, this occurred when the worst pen received the supplemented ration and was being

**At the end of the experiment, eggs from each group were submitted to a New Jersey egg inspector with no identification of the treatment. He favored the methionine eggs on membrane strength and quality but the data are too meager for significance.*

compared to the best pen. In this case, however, the influence of methionine in the other three periods was enough to result in considerable improvement for the 56-week period.

The rate of production was similar for all groups (Table 1). Egg quality measured in Haugh Units and shell strength measured in pounds were also similar (Table 2).

Mortality Reduced

Table 3 shows the data for mortality and body weight. Egg weight was not influenced by any of the treatments. Again in this experiment, mortality was considerably reduced with methionine and the tendency of birds on high energy diets to gain weight modified.

The totals represent weight gained by four different groups of birds while each was on the particular diet for 14 weeks. The totals are, therefore, only indicative and relative.

Table 2 also shows the data collected on eggs and liver composition. Neither seemed to be affected in any way by the diets fed. The alleged increase in liver fat due to high fat diets was not observed in this experiment. In fact, there were no indications that fat as such is an undesirable addition to laying-hen diets.

In Table 4, calculations are given to indicate the value of methionine as a supplement to the high energy diet in the 56-week tests. Each pound of methionine in this instance was worth $5 to $6. Since no beneficial effect on feed efficiency was observed over the year for methionine in the lower energy diet, its value could not be calculated on this basis.

TABLE 1

Feed Efficiency (Pounds of feed per pound of Egg)

Period	Basal	+ MeS	+ Fat	+ Fat + MeS
1	3.03*	3.53**	3.26	3.19
2	3.70**	3.65	3.50	3.12*
3	3.30	3.27	2.90	3.37**
4	4.28	4.19*	4.92**	3.95
Average	3.58	3.66	3.65	3.41

Egg Production (Per cent)

1	70*	59**	63	65
2	54**	52	53	62*
3	50	51	57*	46**
4	37	36*	28**	36
Average	53	50	50	52

* Best Pen ** Worst Pen

TABLE 2

Egg Quality and Shell Strength

Period	Basal		+ MeS		+ Fat		+ Fat + MeS	
	S.S.*	H.U.†	S.S.	H.U.	S.S.	H.U.	S.S.	H.U.
1	6.9	89	6.9	89	7.0	88	6.8	87
2	6.9	84	7.0	83	6.7	80	6.4	84
3	6.2	77	5.7	73	5.9	75	6.2	76
4	6.1	71	6.4	74	6.1	74	6.4	73
Average	6.5	80	6.5	80	6.4	79	6.5	80

* S.S. = shell strength in pounds
† H.U. = egg quality measured in Haugh Units (height of thick albumen)

Liver Analysis (Per cent)*

	Fat	Water	Protein
Basal	6.93 + 2.49	69.85	19.28
Basal + Methionine	5.85 + 4.71	69.64	20.48
Basal + Fat	5.44 + 2.25	69.39	21.47
Basal + Fat + Methionine	5.22 + 2.22	70.10	21.13

Egg Analysis (Per cent)*

	Fat	Water	Protein	Ash
Basal	9.60	74.85	12.27	1.02
Basal + Methionine	10.01	73.72	12.77	1.13
Basal + Fat	9.92	74.78	12.11	1.22
Basal + Fat + Methionine	9.70	75.23	11.87	1.16
Expected based on literature reports	10.2	74	12.5	1

* From production during the 4th period only.

TABLE 3

Mortality, Egg Weight, and Body Weight

Period	Basal	+ MeS	+ Fat	+ Fat + MeS
	Mortality (Per cent)			
1	14	6	17	5
2	9	10	9	7
3	6	3	10	3
4	12	9	10	11
Average	10	7	12	7
	Body Weight Change (Grams)*			
1	+136	+146	+ 37	+ 92
2	— 75	— 56	+217	+154
3	+ 74	— 79	+204	+106
4	— 68	—103	+173	+ 80
Total	+ 67	— 92	+631	+432

* Based on monthly sample weighings of 13 hens on each ration.

TABLE 4

Value of DL-Methionine in High Energy Diet, Based on Egg Production and Feed Efficiency

	Basal + Fat	Basal + Fat + MeS
Number of Eggs	24,582	25,137
Dozen of Eggs	2,048.50	2,094.75
Value of Eggs at $0.50/doz.	$ 1,024.25	$ 1,047.38
Feed Consumed, tons	5.661	5.537
Cost of Feed at $0.05/lb.	$ 566.06	$ 553.72
Gross Profit Margin	$ 458.19	$ 493.66
Increase in G.P.M. due to MeS	—	$ 35.47
Value of MeS per pound	—	$ 6.41

WEATHERABLE PLASTIC FILM FOR OUTDOOR STRUCTURES

A tough, weatherable plastic film whose estimated out-door life-span of some five years makes it suitable for many farm applications has been announced by the Du Pont Company. The material was developed after extensive research to find a film that would withstand lengthy direct exposure to sunlight. Most transparent plastic films tend to deteriorate rapidly from the effects of sunlight.

High tensile strength, clarity, and durability under extremes of temperature make this film — five mil weatherable "Mylar" polyester film — especially suitable for the construction of greenhouses at about one-fourth the cost of conventional glass enclosed types.

Many Applications

Weatherable "Mylar" is also being used for new air-supported structures, since its strength permits use of a lighter gauge film, creating a portable and compact unit. Greenhouses, swimming pool covers, and temporary construction buildings are such applications. Glazing for poultry houses and other farm buildings, storm windows, breezeway enclosures, and patio roofs are other uses for this film.

Thin gauge (one-mil) weatherable "Mylar", laminated to various backings, also appears promising as a weatherable surfacing material for decorative and trim applications.

Agricultural experts have predicted that a suitable plastic material for greenhouses, coupled with a practical type of construction, would result in lower production costs and greater opportunities for the growing of food and flowers out of season.

Incur Less Damage

A report from the Agricultural Experiment Station, Mississippi State College, points out that plastic houses can be built for about one-tenth the cost of steel-framed glass houses. In general, the report states "plastics are reported to incur less damage in hail storms than glass and that plastic structures appear to be tighter than glass, thus requiring less heat."

The Station's preliminary tests and observations point to the desirability of "two layers separated by a dead air space of about two inches to reduce condensation and moisture on the roof and conserve heat." Moisture may condense rather frequently in cold, cloudy weather, thus making a satisfactory heating system essential.

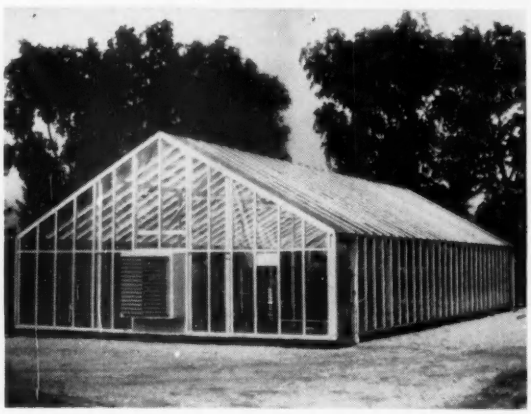
Differences in Management

According to the Mississippi report, "the management of a plastic greenhouse differs from that of a glass greenhouse in two ways. In contrast to glass houses, those covered with plastic heat up very quickly on sunny days, thus requiring ventilation more quickly.* Secondly, much less watering is needed for the plants. During cool wet weather it is very easy to apply too much water."

A report from the Agricultural Extension Service of the University of Delaware also points out the fact that "plastic greenhouses have proven quite satisfactory in experiments and can be built at little expense, compared to glass greenhouses." Among the examples of indoor greenhouses with plastic covers were "a small lean-to built around a window and a simpler structure built like a pup tent with plastic instead of canvas on the poles.

"Ventilation for both structures can be supplied through flap openings. For covering cold frames or hot beds, the plastic stretched over a wooden frame works as well as glass and is far less expensive."

**When single-layer plastic is used, heat cumulation should be comparable to single-layer glass. The dead-air space between plastic layers provides better insulation and heat economy in winter.*



GREENHOUSE covered with plastic film - such as five-mil weatherable "Mylar" polyester film - can be built at low cost.

Remington Farms in Maryland is setting out to show the farmer how to reap worthwhile fringe benefits with minimum cost and effort. Literally, it's the farm's fringes that produce the benefits: Better conservation of soil and water, increased land fertility, and a bumper crop of wildlife.

Set aside to demonstrate this borderland bonus is a corner of the 3,000-acre Remington Farms. It is near the average 200-acre size of American farms and has most of their common physical features. Here Dr. Joseph P. Linduska, who directs the big study and demonstration area operated by Remington Arms Co., Inc., aims to show how acreage normally wasted can be put to work profitably.

Realistic Operation

The operation is kept as realistic as possible. A farm manager follows modern farming practices aimed at making the land pay its way with crops and livestock. Dr. Linduska, meanwhile, sees to it that fringe areas normally uncultivated are "farmed," too. These include fence rows, marshes, gullies, woodland borders, edges of cultivated fields, odd corners, and occasional rock-bare hillsides. Every one of them can be used to advantage. It costs little — sometimes nothing — and often the most effective way to do the work is to "lean easy on the hoe."

Under various federal activities, notably the Agricultural Conservation Program, some financial assistance is available to farmers for such things as living fences, farm ponds and liming of soils. In addition, most state conservation departments offer technical guidance in improving farm habitat for wildlife. Some will provide plant materials and seed as well.

Work Being Done

Here is a glimpse of what is being done on Remington's model farm:

Along roadways and between crop and pasture fields, strong fences of multiflora rose create privacy, serve as windbreaks and provide cover for small game. Around fields and plowed areas are other wildlife plantings, mostly lespedezas (bicolor, sericea, Korean, japonica intermedia, bicolor natob, and others) — good legumes to build soil and to serve as windbreaks against snowdrifts and erosion. In time, they should house and feed rabbits, quail and other wildlife.

Bush lespedeza and tall fescue thrive in the shade strip at the edge of woodlands where pay crops would be stunted. A marshy field supports several varieties of sorghums that make excellent bird feed. Millet grows profusely in a small patch adjoining the marsh and along the margins of several ponds.

A pond is one of those places where leaning easy on the hoe pays off. If the water is drained in the spring, wild millet, smartweed and other native plants will grow cow-high during the summer and feed flocks of waterfowl when flooded in the fall.

"Planned Confusion"

And if an idle corner does not support wildlife now, advises Dr. Linduska, break it lightly with a plow and forget it. The quick natural growth of annual weeds likely will be what birds and animals would ask for if they could.

Dead brush? Burning it can be hazardous as well as harmful to topsoil and ground cover. Instead, pile it high and wide over a stump or old oil drum, along a fence row or at the edge of (not in) an eroded gully. While it helps check further erosion, it also will begin harboring cottontails and maybe a few game birds. Songbirds that perch there will seed a tangle of vines and shrubs to perpetuate it.

This sort of "planned confusion," along with more orderly planting, can make almost any farm a haven for wildlife, says Dr. Linduska, and at the same time make it a better farm all around. And if the owner and his friends are hunters — or if they simply admire the rustic rural scene — they'll rate it an even more welcome bonus.

Biological and Chemical Research in Agricultural Progress

By M. T. GOEBEL, Ph. D.
Research Director
Grasselli Chemicals Department
E. I. du Pont de Nemours & Co. (Inc.)

In spite of the present dislocations, which are spoken of as crop surpluses in the headlines, often with thinly-veiled implications that the farmer is somehow a leech on the American economy, there is growing an uneasy awareness that our children, our grandchildren, or perhaps the generation after them will have to find a solution to the basic problem of food production from a limited acreage which Europe and Asia have been facing for centuries.

There is at least some reason to believe that children now living will survive to see a population in this country double that at present. How is this population going to be fed? Since there are no new prairies to open up, there are four ways: For a century or more, certain highly industrialized European nations did it by exchanging manufactured goods for agricultural products from the western hemisphere. It can be done by putting a large proportion of the U. S. population back on the land. It can be done by decreasing our living standards. Lastly, and this is by far the best answer, it can be done by applying the results of mechanical, biological, and chemical research to agriculture.

Stabilizing Agriculture

Chemical and biological research have already played a part in agriculture over the last 100 years. The effect of the discovery of good disease control and insect control agents has been to aid in stabilizing agriculture. It provides crop insurance for the individual, and it makes it possible for the Department of Agriculture and the state experiment stations to predict more accurately each year the yield from a given acreage.

The widely publicized difficulties about surpluses would be much greater if we had to get along without agricultural chemicals. The ever present danger of uncontrolled losses due to epidemic outbreaks could be met only by expanding acreage and the surplus problem would be extreme in the years when epidemics did not hit. It would require an army of Josephs to provide efficiently for the lean years. Also, of course, quality of the product would not approach what we have today.

Weeds Destroy Civilization

The effect of chemical weed control is somewhat different. Under reasonably favorable conditions, the farmer has always been able to handle weeds in his crops at the expense of his own labor and sweat. When climatic conditions changed, his strength might prove unequal to the task. It has been stated that the most probable reason for the downfall of the Mayan civilization in Mexico around the year 1000 was the encroachment of weeds due to a change in climate. Department of Agriculture scientists who have studied the famine problem in India tell us that the number one job in that country is to get weeds under control by the expenditure of enough manpower. However, chemical weed control is doing the job more efficiently and more cheaply for the farmer. By growing his crop more cheaply, he can compete more successfully in the market place and thus again help to reduce the present surpluses.

Expanding Population

What can we expect of chemistry and biology in our program for agriculture during the coming years? There is a good possibility that a limited number of farmers will have to feed a constantly growing population from a relatively static number of acres. Irrigation and the reclaiming of other types of wasteland will not add very significantly to our existing stock of good farm land. Consequently, we can expect a slow shift in emphasis from the problem of farming more acres with fewer men to the problem of getting more from the same number of acres, still with relatively few men. This change will not come overnight, but when it does come, the realization may dawn on the country rather suddenly, as some other realizations have been dawning recently. After all, the famous surpluses are a rel-

*Excerpts from an address before the Future Farmers of America at Wilmington, Delaware, February 4, 1958.

atively small part of our overall agricultural production. A continuance of our population growth will eat away at them through the years and then suddenly there will be a shortage, unless work is done now to provide for a constantly increasing production per acre.

Forward looking biological investigators and chemists on long range projects in industrial companies and government laboratories are taking account of this future probability. One of the trends which will grow is the use of fertilizers and better techniques of fertilization such as products which release the essential elements in a form available to the plant on a rationed basis rather than in one dose.

Nematodes More Destructive

There are important pests which are currently taking a toll of agricultural production in a very quiet way. For example, it is becoming apparent that nematodes are far more widespread and far more destructive than anyone dreamed of 20 years ago. The supply of trained biological experts who know the ways of these strange pests is still small. However, there is every indication of increased research activity which will some day result in economical and safe ways of combating nematodes in types of soils and under crops where their damage was previously not recognized.

The same is true of fungi which operate below the soil line. Soil is a very complex material and contains almost everything, including a wide variety of living organisms. Wherever crops are grown, certain soil fungi which like to live on the roots of these crops tend to build up. The need for protection against them is recognized and constantly more effective materials to combat them can be expected from research now on the drawing board.

New Field Of Inquiry

One way of improving crops chemically is almost an untouched field. This is through the regulation of plant growth. If crops could be sprayed with chemicals to render them more drought resistant, frost resistant, less luxuriant, or more luxuriant, depending upon the type of growth desired, this would be a great boon. There is reason to believe it can be done when the chemical keys have been found. Gibberellic acid is a portent of the future.

At the California Institute of Technology, Professor Went is making a life work out of the study of the effect of such variables as temperature, light and dark periods, moisture, and purity of the atmosphere on the life and growth of plants. His studies indicate that plants are controlled in their growth, flowering and seed production by a very complicated interaction of hormones just as animals are. The tricks that we may some day perform through chemicals which will supplement or modify these natural regulators of growth processes will seem amazing, and then will be accepted as a commonplace.

We have every reason to believe that plant breeders also will not rest on their laurels but will give us new developments just as exciting and important as hybrid corn was some years ago. All in all, the future looks bright for greatly increased food production without sacrificing the independence of the farmer or the way of life to which we are accustomed.

FUTURE FARMERS OF AMERICA OFFICERS VISIT DU PONT

CRAWFORD H. GREENEWALT, President of Du Pont Company, discusses agricultural problems with national officers of Future Farmers of America during their meetings in Wilmington, Del.

The six national officers of the Future Farmers of America visited Wilmington in February as guests of Hercules Powder Company and the Du Pont Company. Included was a tour of the Du Pont Experimental Station. The FFA officers include: Howard Downing, president, Nicholasville, Ky.; Nathan Reese, secretary, Mooreland, Okla.; Jerry D. Rulon, vice president, Arcadia, Ind.; Leon C. Smith, vice president, Rome, N. Y.; Royce Bodiford, vice president, Millsap, Tex.; and Jerry W. Cullison, vice president, Phoenix, Ariz.

new PRODUCTS AND APPLICATIONS

A new adhesive for bonding vinyl compounds to fabrics of nylon and "Dacron" polyester fiber has been developed by Du Pont. It achieves bonding strengths in excess of 20 pounds per inch, compared to the current average of about five pounds. Plastic-bonded fabrics are applicable to many farm uses requiring strength and weather resistance, including tarpaulins, horizontal silos, and protective covering for animals. Use of bonded fabrics has been limited by lack of suitable adhesives. In uses where flexing is common, the vinyl often separated from the fabric. (BB. Chemical Co., Cambridge, Mass.)

* * * * *

A new household sponge with many uses in the farm kitchen, living room, or barn, provides both abrasive and absorbent materials in one unit. Developed by Du Pont as the result of a two-year research program, the "Combo" synthetic sponge consists of a layer of plastic foam for scouring joined to a cellulose sponge that holds 20 times its weight in water. The "Combo" can be used on dishes, pots, walls, woodwork, sinks, tubs, stoves, and appliances. Although the plastic surface quickly loosens surface dirt, even dried egg, it will not scratch silverware or furniture, nor injure hands or fingernails.

* * * * *

A floating dock, light enough to be carried, but with buoyancy to ferry an 1800-pound steer across a farm pond is made with urethane foam as a buoyant material. The unit, which is eight by four feet and weighs only 125 pounds, is highly maneuverable and can be moved about with a single paddle, or be propelled by sail or motor. Self-filling ballast tanks provide additional stability as an integral part of the hull. The hull is glass reinforced polyester, requiring almost no maintenance. The urethane foam filling gives compressive strength and buoyancy. (Made by Riverside Plastics Co., Mystic, Conn.)

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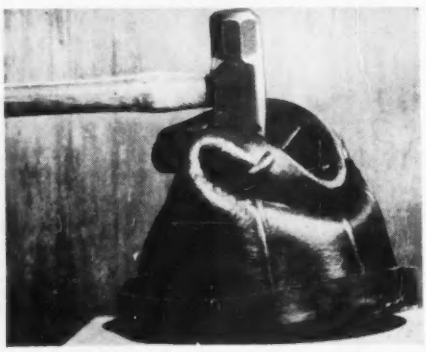


General utility containers molded of fabric and neoprene are lightweight, sanitary, noiseless and virtually unbreakable. The neoprene provides resistance to acids, disinfectants, detergents, and many chemicals which are used on the farm. The containers, which can be nested to save storage space, do not become brittle in cold nor soft in warm weather. Several sizes of buckets and tubs are available, each graduated in quarts or half gallons to make measuring easy. Containers will not mar woodwork or floors. (Distributed by Cauchotex Industries, Inc., New York.)

Plastic Plow Facing Cuts Tilling Time in Half

Successful experiments with plastic-coated plows* in the sticky soil of Hawaii holds promise of developing more efficient tillage tools for U. S. farms. The high colloidal clay content and relative non-abrasiveness of Hawaiian soil makes it sticky when wet. Almost instantaneously, soil builds up on tillage surfaces (even on polished stainless steel) increasing draft and making a moldboard plow into a bulldozer.

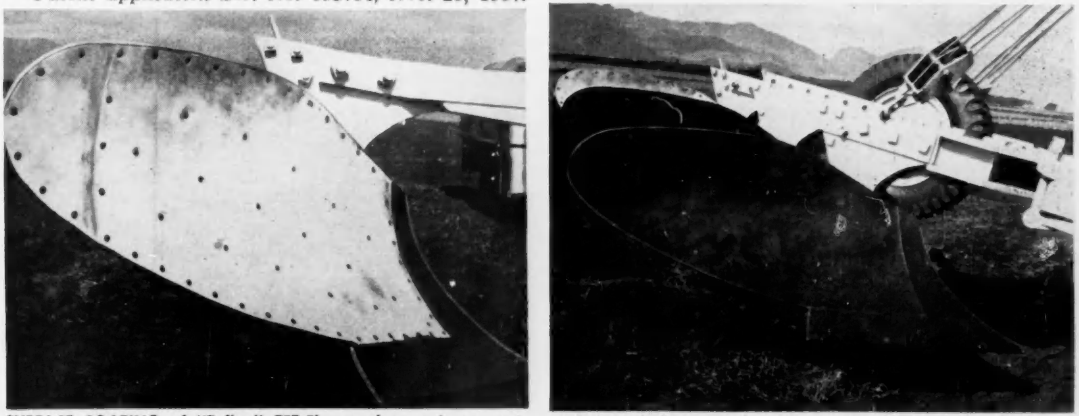
To overcome soil stickiness, experiments were started by the Pineapple Research Institute with a surfacing of "Teflon" TFE-fluorocarbon resin — the Du Pont plastic whose slippery surface sheds almost any sticky substance from chocolate to clay. "Teflon" made possible use of moldboard plows and cut plowing time in half and tractors using it could be operated in third gear instead of second.

Further study led to improved methods of surfacing with "Teflon", thus cutting down on wear and on the cost of the plastic. Originally a solid sheet was used, with the greatest wear showing on the wing of the moldboard. Another method is to apply the plastic in strips so that sections can be replaced as wear occurs, rather than the entire surface sheet.

Studies are now being carried on to test the applicability of such surfaces for U. S. soils. Wear of the layer of "Teflon" is a principal problem, because of the higher abrasion of soils in this country. Even clay soils, which have sticky properties similar to those found in Hawaii, include sand which has abrasive effect on "Teflon". A number of combinations have been tried to reinforce the plastic surface; other compounds are under consideration. Adding ferric oxide, for instance, gives higher resistance to "Teflon".

A second area of investigation is the balance of higher costs of surfaced plows to the savings in time and motive power. The economies can be relatively modest and still make coating worthwhile, since the cost of the plow is a relatively small part of the total plowing cost.

*Patent application Ser. No. 698754, Nov. 25, 1957.



SURFACE COATING of "Teflon" TFE-Fluorocarbon resin prevents soil from sticking to plow surface, increasing efficiency and reducing draft power for tilling. Coatings can be applied in sheets of "Teflon" (left) or by enamel coating (right).

HOW TO DRAIN OUT ANTI-FREEZE

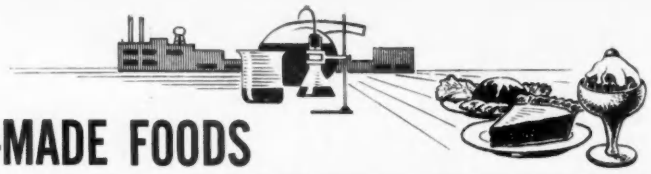
More than half the winter-worn anti-freeze solutions and rusty coolants in millions of cars, trucks, and tractors will remain in the engine blocks if only the radiator petcock is opened when cooling systems are drained out before adding fresh anti-freeze.

To avoid corrosive engine damage, the petcocks on the sides of the block must be opened so that the entire cooling system can be completely drained of any rusty or dangerously acid solutions, according to a series of tests conducted by Du Pont.

Modern automobile engines are so constructed that the coolant level in the motor block does not fall below the water pump when the radiator petcock is the only one used to drain the cooling system. Although the radiator would be emptied by opening of the radiator petcock, more than half the coolant would still be left in the block.

potential sales in a

NEW ERA OF TAILOR-MADE FOODS



By C. B. HENRICHSON
Development & Service Representative
Grasselli Chemicals Department
E. I. du Pont de Nemours & Co. (Inc.)

Rapid rises in farm productivity and in our overall standard of living have brought on a revolution in the food habits of the nation: Diets have become much improved and convenience foods with "built-in maid service" have captured a substantial share of the market. With the better diet and the less active life of the machine age has come the problem of weight control. Health studies, fashion designers and the family doctor have all combined to make millions aware of the importance of weight control.

The low-calorie "businessmen's lunch" or the desertless dinner of the figure-conscious housewife have often meant a reduction in food consumption that sends shock waves all the way back to the farm. The strawberry shortcake or apple pie not eaten means that much less income.

Waistline Control

Potentially, diet-emphasis could have serious repercussions on the farm economy. Some 65 million people may be interested in dieting, when the overweight, diabetic, and pregnant are included. Beyond that, additional millions are determined to keep the waistline where it is and they, too, are keeping one eye on the calorie chart. Thus, between half and two-thirds of the adult U. S. population are potentially interested in the calories they consume. With such a vast prospective market, it is easy to see why the present annual expenditure for diet foods has risen from $56 million in 1953 to $250 million in 1957 — more than the total spent for baby foods. It also points to greater markets in the future for farm products that can meet diet standards.

Non-nutritive sweeteners such as sodium or calcium cyclamate and saccharin* represent important ingredients in the production of low-calorie foods, since many foods shunned by dieters derive their calorie content largely from the sugar customarily used with them or even needed to make them palatable. Low-calorie foods are simply a recognition of the fact that people have different nutritional requirements.

Artificially sweetened foods greatly increase the variety and the amounts of foods that can be consumed within the dietary regimen. For example, many tasty desserts, beverages, and dressings can be formulated with the cyclamates as sweetening agents. And, whereas the dieter may eat nothing rather than a dry lettuce leaf, low-calorie dressing will allow him to enjoy salad. Add to this desserts and other foods and the market can be a big one.

Non-sugar Sweeteners

Thus far, the major strides made by low-calorie foods using non-sugar sweeteners have been in the duplication of conventional products. This approach has been successful in some fields but not others. Canned fruits and prepared desserts have made good use of sweeteners. Attempts to make a really top-quality jelly, on the other hand, have proved more difficult because no way has yet been found to produce a good gel without sugar.

The question arises, however, is duplication necessary? Research may develop new types of products to do the same job. There may be a low-calorie spread that would appeal to the jelly appetite, or a dessert that would keep the cake-lover happy. Low-calorie pie filling is easy to make, but the crust still has the calories. The answer is either a low-calorie pie crust or a dessert that can satisfy pie appetite without crust. Then there is that relatively new institution, the coffee break. What sales potential there could be in a 20 to 50 calorie snack to go with morning coffee!

Only Part of Answer

The main reason that many of these products have not been developed is that non-nutritive sweeteners are only part of the answer.

These are the only non-nutritive sweeteners permitted by the Food and Drug Administration. Sodium and calcium cyclamates are manufactured by Du Pont under the trademark "Cylan."

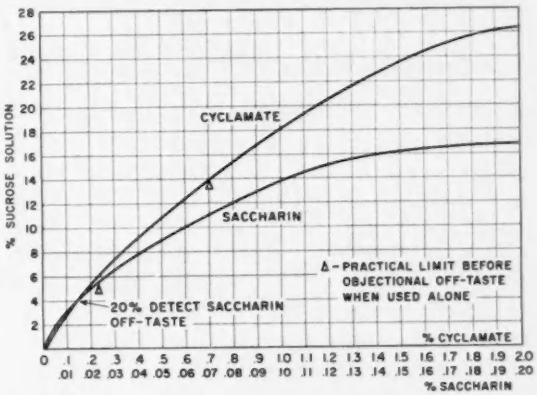
They sweeten, but do not affect the calorie count of fats and starches in the recipe, or provide the physical qualities of sugar. Consequently, other materials have to be used to replace these properties. The amount of cyclamate used in ice cream will not effect sufficient lowering of the freezing point, nor will it contribute appreciably to the total solids. Cyclamates will not caramelize — a property which has both advantages and disadvantages. They will not replace the added texture effect in a cake or baked goods nor by themselves replace more than one-thirtieth of the bulk or weight imparted by sugar in a given product.

The use of cyclamate in products such as canned fruit, fruit juices, apple sauce, pickles, liquid sweeteners, gelatin desserts, and puddings is rather straightforward and entails the establishing of proper flavor and sweetness balance. By using a taste panel, various concentrations of cyclamate and various concentrations of saccharin were related in sweetness to given concentrations of sugar solutions. These results are shown in the graph.

Higher Sweetness Ratio

The apparent sweetening power of both saccharin and cyclamate decreases as their concentrations increase. At low sweetness levels, cyclamate is up to 60 times as sweet as sugar, but, at normal sweetness levels, (cup-of-coffee levels) cyclamate is about 30 times as sweet as sugar and saccharin around 300 times as sweet as sugar. This variation is due to the off-tastes of these products becoming more prominent until at extremely high levels they predominate. The graph shows that the upper use level of cyclamate alone is in the range of about 14 per cent sugar equivalency. Sweetening above that level leaves not so much a bitter aftertaste but produces an undesirable sweetness. As the concentration of cyclamate is further increased, an undesirable aftertaste is noted and it becomes almost impossible to obtain equivalent sweetness higher than 25 per cent sugar. Previous studies of saccharin have shown its bitter aftertaste is detected at very low sweetness levels. It is between the four and eight per cent sugar levels that the majority detect the different sweetness of saccharin and the bitter aftertaste becomes prominent. This makes sweetening above a 13 per cent sugar equivalency almost impossible.

COMPARISON OF PERCENT SUCROSE CONCENTRATIONS WITH CYCLAMATE SOLUTIONS AND SACCHARIN SOLUTIONS



Utilizing a 12-to-one cyclamate-saccharin ratio, it was found that essentially the sweetness of cyclamate and saccharin was additive and this combination permits sweetening to much higher levels. Since the cyclamate and saccharin relationships to sugar are not straight line relationships, it is possible to sweeten advantageously with the combination, utilizing concentrations of each that have a high sweetening power.

In summary, it can be said that the advent of low-calorie foods has made eating so pleasant that the "Spartan" approach of refusing food does not appear to be the only answer to the weight control problem facing Americans today. The resulting market for low-calorie foods offers a great opportunity for food growers and manufacturers of almost any size, big or little, who can produce a good quality, low-calorie product. The key to success in the development of low-calorie food products lies, not in trying to imitate normal calorie foods, but in the ability of food technologists to create new low-calorie food concepts to satisfy our various appetites.

LINERS FOR STORED APPLES

Sealed polyethylene liners can do much to prevent scald and decay in stored Watsonville Newton apples. At the Fresno, Calif., Quality Maintenance Laboratory, apples sealed in poly-coated kraft bin liners or pallet load covers came out of a 9-month, 40°F storage period in excellent shape. Check lots held under the same conditions were substantially inferior in every respect. AGRICULTURAL MARKETING SERVICE.

CONTROL OF BRUSH WITH PELLETS

A single application of 16 pounds of fenuron* pellets per acre will control post oak, blackjack oak and winged elm growing on upland sandy soils. Fenuron pellets should be broadcast uniformly over the area being treated. They can be spread by hand, broadcast seeder or with an airplane. Application should be made from early February until May 15th. There is no drift hazard with fenuron. However, it should not be applied within 100 feet of shade trees, orchards or other desirable plants. Applications should not be made on steep slopes above desirable plants or during periods when heavy rains may wash the chemical into contact with roots of desirable plants. — TEXAS AGRICULTURAL EXPERIMENT STATION.

*"*Karmex*" *fenuron herbicide is made by Du Pont.*

PLASTIC AIDS GREENHOUSE WATERING

A simple plastic basin used in greenhouse experiments here gave better irrigation and required two-thirds less labor than hand watering methods of growing pot flowers. The basin is formed by draping a large sheet of polyethylene across the greenhouse growing bench. Flower pots rest on wooden slats in the basin, and a single flooding provides water for all pots to absorb upward. The method has great possibilities for certain crops. It cuts labor needs to about a third of those required for watering pots individually from a hose, and does a better job of irrigation, giving better uniformity. Hand-irrigated pots, in comparative tests, have often wilted a day sooner than those on plastic. Two possible drawbacks exist — salt accumulation and possible disease transfer through the common source of water. The possible damage from soluble salt accumulation in the pots is quite insidious, since the rate of accumulation varies with climatic conditions and the size of the plant. Salt can, however, be flushed out by hand watering once every two to four weeks, and so far no differences in disease spread have been noticed.—COLLEGE OF AGRICULTURE, UNIVERSITY OF CALIFORNIA.

FLIES USED TO DETECT PESTICIDE RESIDUE

Tiny fruit flies that congregate on overripe fruit are being put to good use by scientists. Flies are reared on canned pumpkin in wide-mouthed fruit jars. Paper towels replace jar lids. When one to three days old, flies are removed and used for detecting traces of pesticide residues in treated soil or on bark of trees. By counting dead flies, scientists can estimate the amount of insecticide residue in the soil or on the bark and determine whether dilution or concentration of the spray is necessary, and the approximate amount of each dilution or concentration needed. Furthermore, they can test sprayed fruit to make sure it is safe for human consumption.

This "bioassay," method has indicated that significant amounts of insecticides remained in soil 4½ years after treatment. Bioassay is a relatively new method for measuring pesticide residues and is expected to become an increasingly useful research tool. Bioassay equipment is less expensive than facilities for making chemical analysis. Simplicity is also advantageous where facilities and personnel are limited. The method is useful when chemical analysis would be impractical. — AGRICULTURAL EXPERIMENT STATION, UNIVERSITY OF ARKANSAS.

SEED TREATMENT RAISES PEA YIELD

Chemical seed treatments have increased field stands of peas by as much as 50 per cent. Also, a planting rate that provides about 20 seeds to each yard of drill row gives the best returns. This means seeding at the rate of 12 to 20 pecks to the acre, depending on seed size. Peas harvested at a tenderometer grade of 91 to 95 will prove most profitable where the crop goes to the freezer, while peas at grades of 96 to 105 bring best returns at the cannery.—NEW YORK AGRICULTURAL EXPERIMENT STATION, CORNELL.

NEW PICKLE GROWING FERTILIZER RECOMMENDED

Coastal Plain pickle growers may get a better crop with an under-row application of 1-2-2 fertilizer ratio than a 1-2-1, which has been recommended on the basis of fertilizer trials conducted on Ruston fine sandy loam in 1956 and 1957 at Hope, Ark. When soil tests indicate low potassium content, additional potassium should be applied under the row. A general recommendation is under-row application of 30, 60, and 60 pounds of nitrogen, phosphorous, and potash, respectively, followed by nitrogen sidedressings of 30 pounds an acre when vines begin to run and 30 pounds two weeks later. The last nitrogen sidedressing is especially recommended if irrigation is available to prolong the harvest season. — AGRICULTURAL EXPERIMENT STATION, UNIVERSITY OF ARKANSAS.

PEST CONTROL DOUBLES OKRA PRODUCTION

Okra is extremely sensitive to nematode damage. It is, in fact, often used as an index crop to help determine the presence of nematode infestation of soil. In a cooperative study between a commerical grower in Florida and the Du Pont Company, sodium methyldithiocarbamate* was applied to the soil in which okra was to be planted. Application was at the rate of 12.5 gallons per 9680 linear feet of row (in one acre), with a single shank delivering the chemical to a depth of eight inches down the center of previously prepared beds 36 inches wide.

Treated okra seed was planted 19 days after application. The results of the tests, based on eight pickings, showed that the yield of marketable okra was 1039 pounds per acre in the untreated controls, while treated plots showed twice that yield, 2099 pounds. The results reflect nematode control, but to what extent they also reflect control of soil fungi and weeds is not known. Commercial weed control was obtained in a band 10 to 12 inches wide down the center of the bed for four weeks after soil treatment.

**Du Pont manufactures sodium methyldithiocarbamate under the trademark, "VPM".*

HIGH EFFICIENCY TURKEY STARTER RATIONS

Turkey growers soon may be using high-efficiency turkey starter rations if tests continue producing satisfactory results. A 13-per cent increase in body weight and a 30-per cent decrease in feed required per pound of body gain have been achieved in an eight-week trial that will run to market weight. At 18 weeks of age, control turkeys weighed an average of 12.7 pounds and required 2.8 pounds of feed per pound of gain, while experimental birds averaged 13.5 pounds and required only 2 pounds of feed per pound of gain.

The rations supplemented with amino acids gave the best response with growth appearing to plateau at a protein level of approximately 32 per cent but feed efficiency continued to improve up to the 36 per cent level. More research is necessary before the rations can be recommended for practical usage. — OKLAHOMA AGRICULTURAL EXPERIMENT STATION, OKLAHOMA STATE UNIVERSITY.

CHEMICALS FOR WEED CONTROL IN COTTON

"Karmex"* DW herbicide was applied just before the second irrigation at one pound and 1¼ pound rate per acre in 26 gallons of water. The fields had been cultivated twice before application. Cost per acre was $6.65. "Karmex" very effectively controlled annual water grass, annual morning glory, and pigweed throughout the remainder of the growing season. Effectiveness of the material could be judged where cooperator skipped a row or when a nozzle clogged.

At least three or possibly four hoeings were eliminated by spraying. Fall rains aggravated the weed problem where "Karmex" was not applied. Hand labor could not weed when required and in many instances weeds were taller than the cotton at picking time while the treated plots were completely free of weeds. — DEPT. OF AGRICULTURAL SERVICES, N. M. COLLEGE FOR AGRICULTURE AND MECHANIC ARTS.

**Du Pont trademark.*

Industrial Programs for Aid to Education and Research

The current reexaminations of the U. S. educational system have focused attention on the financial contribution that business organizations make to institutions of higher learning, in various forms of direct grants and grants for research activity. They now give well over $100 million each year to such institutions. The rapid rise is reflected in the fact that the amount doubled between 1950 and 1955, when it reached some $80 million. In addition, many firms maintain a program of grants for commercial research.

The Du Pont Company — whose aid-to-education program was launched 40 years ago — provides funds for aids to teaching, grants for fundamental research, and fellowships. For the 1958-59 academic year, the fund amounted to nearly $1.15 million.

Industrial Research

An additional allocation of funds to institutions of learning is made by several of Du Pont's 11 industrial departments for research which is of commercial interest. One example is the current grant of more than $50,000 by the Polychemicals Department for applied research in agricultural applications of high-content nitrogen compounds. This fund went to 16 institutions with major agricultural research units and will be used for research on "Uramite" and "NuGreen" fertilizer compounds, as well as "Two-Sixty-Two" feed compounds for cattle feed.

The Du Pont Electrochemicals Department, which manufactures L-lysine monohydrochloride, one of the eight amino acids considered essential for human nutrition, has granted nearly $400,000 in the past five years for research on the nutritional role of amino acids. The work, which supplements the company's own investigations, is for four types of studies in this field, including the fundamental aspects of amino acid metabolism, pharmacological properties of lysine, and nutritional improvements through amino-acid supplementation of foods.

Other industrial departments have supported similar studies, both in agricultural fields and in other areas in which the company's manufacturing interests are centered. Current grants for such research are about $350,000.

Du Pont's regular program provides for grants to 135 universities and colleges for the 1958-59 academic year. The current $1.15 million allocation is about 10 per cent higher than for the previous academic year.

Nearly all of the increase and more than half of the entire program are for the improvement of teaching in universities, colleges, and high schools. The grants will support science and mathematics as well as other subjects. The growth of the Du Pont program since its inception in 1918, as well as the change in emphasis, reflects the changing needs of the schools. Grants for fellowships in science, which once made up the entire program, and for fundamental research are being continued.

As in previous years, decisions on the use of the funds and the selection of people to receive individual grants are left to the institutions.

In recent years, discussions with educators have indicated that maintaining high standards of teaching is a major problem at all levels of education in view of higher costs and increasing enrollments. Du Pont's grants for advancing teaching, which proved effective in science, mathematics, and other liberal arts courses, are now being extended to medical schools for the first time.

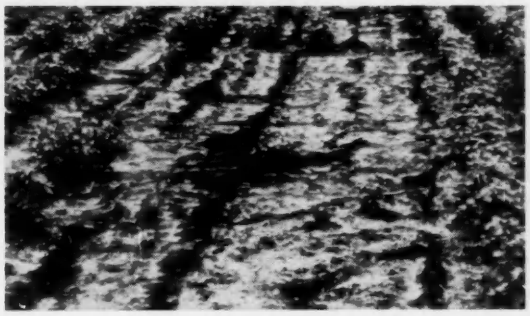
Aids to Teaching

The grants for teaching total about $664,000 to more than 100 privately controlled colleges and universities, including 12 medical schools. Another $309,000 has been allocated to universities for fundamental research in chemistry. The largest part of this program, $250,000 of grants-in-aid to 20 schools, is intended to build up knowledge through support of research in chemistry by enabling these institutions to expand their unrestricted research activities.

Under the oldest part of the program, Du Pont has awarded 40 fellowships to 25 institutions. Each fellowship provides $1,800 for the student ($1,500 for first year students), with an additional allowance of $300 if the student has one child, or $600 if more than one. Tuition and educational fees are also paid, and a contribution of $1,200 is made to the school for each fellowship.

Seed Treatment and in-the-Row Fungicides Improve Cotton Production

EVEN STANDS of cotton grow following in-the-row application of "Parzate" liquid nabam or zineb fungicide to control disease.



POOR STANDS of cotton shown in these untreated rows resulted from attacks of seeding root-rot and damping-off diseases.†

By D. C. DRAKE, Ph. D. and J. A. EVANS, Ph. D.
Grasselli Chemicals Department
E. I. du Pont de Nemours & Co. (Inc.)

Treatment of cottonseed to prevent seed rot plus in-row application of fungicides for control of seedling rots and damping-off offer means for improved cotton production. The scarcity of good quality planting seed this year emphasizes the need for seed and seedling protection from disease if good stands of cotton are to be obtained.

A study by Du Pont in cooperation with a commercial seed company was undertaken, using two lots of seed. One was mechanically delinted and flame processed, while the other was delinted with sulfuric acid. The seed was then hand treated with slurries of mercurial seed disinfectant ("Ceresan" 100 seed disinfectant*) at dosages from one to three ounces per hundredweight. Forty-gram lots (about 400 seeds) were planted in four plots of 40-foot rows.

Increased Production

Because of the cold weather and wet soil after planting, the incidence of seed rot and soreshin or seedling blight was high. Untreated control seed, which had been acid delinted, produced a six per cent final stand, while machine delinted seed was up to 40 per cent. At the low dosages of one ounce per hundredweight, the treated seed produced final stand increases of 63 per cent for machine and 419 per cent for acid delinted seed. At two ounces of chemical, however, the increase was 88 and 523 per cent respectively. Two ounces is considered a minimal satisfactory application and higher dosages would usually be expected to give better seed performance under extreme conditions, especially with acid-delinted seed, which is more susceptible to rot.

Post-Emergence Effect

Seed treatment also has the effect of reducing post-emergence damping-off (seedling blight) or soreshin. For instance, treated acid-delinted seed showed a loss of less than 10 per cent in stands between first emergence and 12 days later, while untreated seed loss was at 44 per cent. There was virtually no loss with treated machine-delinted seed, while untreated losses were at 12 per cent. Late emergence in some plots planted with treated seed actually increased the stand in the first 12 days after emergence.

Significant as the post-emergence effect of seed treatment is for full production, there are situations where it is desirable to supplement mercury seed treatment with a fungicide soil application to give longer protection. Du Pont "Parzate" liquid nabam or zineb fungicides have been registered for soil application in three states, Texas, Missouri, and California. Additional tests are under way for wider use.

It is estimated that the losses to growers from cotton seedling diseases caused by Rhizoctonia, Pythium, and Fusarium in Texas alone have been some $13 million annually.

*Du Pont trademark.

†Photographs courtesy Cotton Disease Investigations, Texas Agricultural Station and ARS, USDA.

Recent research in the cotton belt has shown that in-the-row applications of liquid nabam or zineb fungicide in combination with captan and pentachloronitrobenzene controls seedling root rot and damping-off diseases, resulting in greater and more uniform stands.

Thorough Mixing with Soil

It is necessary, for best results, to mix the fungicide thoroughly with the soil from the seed level to the soil surface in a band ¾ to 2 inches wide. This thorough application will provide a treated area in which the seed will grow. Provision should be made to insure treatment of the top ¼ to ½ inch of soil since this is the area where the organisms that cause damping-off and soreshin are most active. A low pressure power take-off insecticide sprayer is easily adapted to apply liquid fungicide, while dusts are applied in dusters that have high air velocity in the delivery tubes with attachments to reduce the velocity at the outlets.

Tests made with treated seed and proper application of fungicide to the soil underline some of the economic advantages to be derived from chemical applications to cotton. The cost of seed treatment is far less than the substantial value of the increased yields. For example, the cost of the chemical to disinfect seed used in one acre of soil is about five cents, while replanting that acre would involve some five dollars. Soil treatment has a substantially higher cost but for many areas is a sound investment.

New Herbicide Is Based On Trichlorobenzoic Acid Salt

A new weed killer that shows outstanding promise for control of bindweed and other deep-rooted perennial weeds, some species of woody vines such as trumpet vine, and certain types of woody brush, will be made available this season by Du Pont. The chemical is based on the dimethylamine salt of trichlorobenzoic acid and will be marketed as "Tryben" 200 weed killer.

Development of herbicidal uses of compounds based on trichlorobenzoic acid has been underway during the past two years in cooperation with state weed-control investigators in areas where deep-rooted perennials are a problem. Many successful trials have been made in such widely scattered areas as Kansas, Nebraska, the Dakotas, Minnesota, Texas, California, and Oregon.

Spray Application

"Tryben" 200 is a liquid containing two pounds of trichlorobenzoic acid equivalent per gallon; it is diluted with water for spray application. It is non-selective, and works through both foliage and roots. Spray volume per acre varies, depending on the ground cover. Best results are obtained if application is made after foliage has appeared in the spring, but before growth has progressed sufficiently to retain more than half the spray.

Dosages of five to ten gallons of "Tryben" 200 weed killer (ten to 20 pounds acid equivalent) per acre are recommended for control of such deep-rooted perennials as field bindweed, leafy spurge, Canada thistle, Russian knapweed, bur ragweed; and for woody vines such as trumpet vine, honeysuckle, and smilax.

Ten to 15 gallons of the product per acre will control a wide range of perennial and annual broadleaf weeds for one year or longer. Weeds controlled at this rate of application include the above noxious perennials, as well as dandelion, plantain, dock, dog fennel, ragweed, and wild lettuce.

Thorough Spraying Recommended

To control certain species of woody brush such as conifers, wild roses (including McCartney or Cherokee rose), sumac, persimmon, sassafras, and hackberry, the recommended dosage is two gallons in 100 gallons of water. For these species, thorough spraying of foliage and stems, as well as the ground under plants, is recommended.

Since herbicidal compounds based on trichlorobenzoic acid are non-selective and somewhat volatile, they present a potential hazard to certain sensitive crops. Label precautions should be carefully followed.

Farmers Ask About . . . .

Q: Does grain sorghum have the vitamin content of yellow corn?

A: No, but the deficiency can usually be made up by feeding livestock green, leafy alfalfa hay.

* * * * *

Q: What are the labor requirements for broiler production?

A: About 80 hours of work to produce 1000 broilers, according to the Arkansas Experiment Station. Larger flocks reduce the average.

* * * * *

Q: What is meant by "agribusiness"?

A: The total process of growing, processing, and purchasing food and fibers is called agribusiness. Almost 40 per cent of the nation's work force is employed in some phase of "Agribusiness".

* * * * *

Q: Is there an advantage to gassing chickens before slaughter?

A: Gassing with carbon dioxide causes faster and more complete bleeding, says the USDA.

* * * * *

Q: Are there sex differences in breast blisters in broilers?

A: Breast blister (sternal bursitis) is more common among males and higher incidence is found in heavier birds.

* * * * *

Q: How has dairy-farm efficiency been affected by mechanization?

A: With 80 per cent of the operation mechanized, one man can tend 40 milking cows on a typical dairy farm. In Soviet Russia, with milking only mechanized, one woman is assigned to care for about 10 or 12 animals.

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Q: Can eggs be sold by vending machine?

A: About $2 million worth of eggs are now sold annually by vending machines.

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Q: Could edible oil be extracted from citrus seed?

A: Yes, about 300 tons of oil could be obtained per million boxes of fruit.

Q: Is Du Pont cutting its plant construction program this year?

No, expenditures for new plants and facilities are expected to exceed by perhaps 10 per cent the $220 million record of 1957.

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Q: What are the most important vegetable diseases today?

A: The "big six" according to the College of Agriculture at Cornell, are: Cucumber mosaic, lettuce yellows, tomato early blight, tomato blossom end rot, cabbage club root, and bean blight.

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Q: What has happened to corn productivity since the War?

A: The 1957 average yield per acre was at a peak 46.8 bushels, compared to the 1946-55 average of 37.8

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Q: Has total cropland harvested since 1940 gone up?

A: No, the 1957 acreage was about the same but farm size is up 40 per cent and average output per farm rose 74 per cent.

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Q: Has agriculture gained from the rise in U. S. income levels?

A: Yes, if the U. S. consumer were still eating the 1935-39 diet, he would spend but 16 per cent of his income for food, whereas he actually spends 25 per cent.

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Q: Are crop-yield rates still rising?

A: Yes, the 1957 yield per acre was up three per cent over 1956 and 25 per cent above the 1947-49 average.

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Q: What causes baby-pig anemia?

A: This increasing problem is due to the lack of dietary iron. Iron supplementation through mineral soil, iron tablets, or iron injections can make up the deficiency.

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Q: How extensive is chemical weed control?

A: In 1957, farmers sprayed 350,000 acres of cotton, 12 million acres of corn, and 2.5 million acres of rangelands for weed control.

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